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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,225	02/09/2004	David James Wilson	ALC 3116	6742

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EXAMINER	
CHOU, ALBERT T	

ART UNIT	PAPER NUMBER
2616	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/773,225	WILSON ET AL.	
	Examiner	Art Unit	
	Albert T. Chou	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 October 2007 for the amendment*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 February 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The following is a response to the amendment filed on October 31, 2007:

- Claims 1-22 are pending in the application.
- The specification is objected to under 37 CFR 1.71.
- The drawings are objected to minor abnormality.
- Claim 16 is rejected under 35 U.S.C. 112, second paragraph.
- Claims 1-8 and 10-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,839,703 to Jinzaki, in view of US Patent Application Pub. No. 2005/0086520 A1 by Dharmapurikar et al. (hereinafter "Dharmapurikar"), and further in view of US Patent No. 7,219,184 to Stojancic.
- Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,839,703 to Jinzaki, in view of US Patent Application Pub. No. 2005/0086520 A1 by Dharmapurikar, further in view of US Patent No. 7,219,184 to Stojancic and further in view of US Patent No. 6,947,931 to Bass et al.

Specification

2. The disclosure is objected to under 37 CFR 1.71, as being so incomprehensible as to preclude a reasonable search of the prior art by the examiner.

For example, among other things, page 10, [0034], the disclosures to Fig. 4 and Fig. 5 are not understood:

"Figure 4 shows a sliding window of fixed size to select the ideal groupings of bits to best group addresses in order to reduce the number of prefix lengths within a group. In this embodiment the bits from the sliding window are used as the extra filter. There are two further aspects of this scenario. The first is simply to use statistics of the ideal location of the sliding window to build the filter. In this case the position of the sliding window is fixed as shown in FIG. 5. The second scenario is to dynamically determine the ideal position of the window based on the current routing table".

What does "*select the ideal groupings of bits to best group addresses*" mean? What is Applicant's definition of "*ideal groupings of bits*"? What are the criteria of being *ideal* or *not ideal groupings* of bits?

What does "*statistics of the ideal location of the sliding window*" mean? What is Applicant's definition of *the ideal location*? How and from where *statistics* are generated and collected?

What does *"to dynamically determine the ideal position of the window based on the current routing table"* mean? In what ways or steps can the "*ideal position*" be *dynamically determined*?

Additionally, there is no description pertinent to "Hi Ptr" or "miss Ptr" and its inter-relationship with the Grouping Table as illustrated in Fig. 4. The titles of Figures 4 and 5

including the term "Ideal Offset". It is not clear what "offset" will be used for the algorithm?

Applicant is required to submit an amendment which clarifies the disclosure so that the examiner may make a proper comparison of the invention with the prior art.

Applicant should be careful not to introduce any new matter into the disclosure (i.e., matter which is not supported by the disclosure as originally filed).

Drawings

3. The drawings are objected to because:

The terms "lengths" used in Fig. 2 and "length" used in Fig. 5 are incorrect.

According to the specification and Applicant's response/confirmation to Examiner's first office action (see the last two paragraphs of pag1 of the Remarks section), the "length of prefixes" is the "number of bits of prefixes". In other words, the "length of prefixes" is "an integer", like 2, 4, 7, or 17, etc.

However, the terms "lengths" and "length" used in Figs. 2 and 5 are not consistent with and Applicant's response/confirmation. For example, each entry of the filter table in Fig. 2, or each entry of the Grouping Table in Fig.5, apparently is not "an integer". Instead, it appears to be a bit field or "prefix length" (see p. 3, line 15 of the specification) as shown in Fig. 2, or an address pointing to a data structure as shown in Fig. 5.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 16 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

See Examiner's objection statements to Specification and Drawings recited in Section 1 and 2 of this office action.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-8 and 10-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,839,703 to Jinzaki, in view of US Patent Application Pub. No. 2005/0086520 A1 by Dharmapurikar et al. (hereinafter "Dharmapurikar"), and further in view of US Patent No. 7,219,184 to Stojancic.

Regarding claims 1 and 17, Jinaki teaches a method and a system of performing a longest prefix match comprising the steps of:

a) filtering a key into a plurality of filter fields **[Fig. 17; Filtering Retrieval Key into A-bit, B-bit & C-bit fields]**, each of which is associated with a respective filter table **[Fig. 17; First/Second/Third Retrieval Table]**;

b) performing a longest prefix match (LPM) operation on each of the filter fields in their respective filter tables, wherein each LPM operation yields a result indicating lengths of prefixes potentially matching the key **[Figs. 6 & 17; each of retrieval tables, i.e. First/Second/Third Retrieval Table, yields a result of lengths of prefixes potentially matching its respective search key]**;

c) intersecting the results to obtain a set of potential prefix lengths **[Fig. 17; The results of lengths of prefixes are input to a Synthesizing Circuit to obtain a set of potential prefix lengths; col. 12, lines 41-50]**.

Jinaki does not expressly teach performing a series of hash lookups, based on the previously indicated potential prefix lengths, beginning with the longest potential prefix length and progressing to successively shorter potential prefix lengths until a matching prefix is found, which is the longest prefix matching the key.

Dharmapurikar teaches a method and an apparatus for performing the Longest Sub-string First (LSF) on a data stream comprising a string of bits to obtain the multiple sub-strings matching **[Figs. 1 & 2; pars. 0043-0048]**. Dharmapurikar also teaches that in the case of multiple matches at the same time in the array of Bloom filters 200, the analyzer 110 **[Fig. 1]** is probed with the longest sub-string down to the shortest sub-

string **[Fig. 2; W-byte string – 3 byte string]**. The search stops as soon as a sub-string is first confirmed by the analyzer 110 **[par. 0046]**.

Stojancic teaches a method and an apparatus for Longest Prefix Matching LPM, which performing a series of hash lookups, based on the previously indicated potential prefix lengths, beginning with the longest potential prefix length and progressing to successively shorter potential prefix lengths until a matching prefix is found, which is the longest prefix matching the key **[the approach finds the prefix group and steps through comparing each prefix, starting with the longest prefix and progressing through to the shortest prefix until a first match is found; col. 2, lines 1-29]**.

It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to combine Dharmapurikar's and Stojancic's disclosures into Jinaki's information apparatus by performing the longest prefix to input data stream in order to obtain a potentially matched path information.

The motivation for combining the reference teachings would be to efficiently use the divided tables that are divided corresponding to the prefix lengths to reduce the required memory size and, at the same time, increase the search and retrieval speed.

Regarding claim 2, Jinaki teaches each filter may use a different method for filter field extraction **[Fig. 6; col. 5, lines 56-65]**.

Regarding claims 3-6, 13-15, 19, 21 and 22, Jinaki teaches the key is an IP address **[col. 7, lines 31-41]** and the hash lookups are used for routing decisions **[Figs. 5 & 6; Routing decision for a routers; col. 5,, lines 36-55]**, the plurality of filter fields are created by extracting bits from the IP address **[Figs. 5-6, 17; col. 5,, lines 36-55, col. 7, lines 31-41]**, the extracted bits are concatenated into filter fields **[Fig. 17; Filtering Retrieval Key into A-bit, B-bit & C-bit fields]**, each filter field being a key for said associated filter table **[Fig. 17; First/Second/Third Retrieval Table]**, only a portion of the IP address is filtered into filter fields **[Figs. 6 & 17; A-bit, B-bit or C-bit field]**, and the IP address is 128 bits/32-bits long **[col. 7, lines 31-41, col. 12, lines 51-55]**.

Regarding claims 7, 8 and 20, Jinzaki, in view of Dharmapurikar, teaches the longest prefix match operation on each filter field and associated filter table is performed in parallel **[Jinaki: Fig. 17; simultaneous retrieval; col. 12, lines 4-55]** and a lookup table is used to perform the LPM operation **[Dharmapurikar: Figs. 1 & 2; a method and an apparatus for performing the Longest Sub-string First (LSF) on a data stream comprising a string of bits to obtain the multiple sub-strings matching; pars. 0043-0048]**.

Regarding claims 10-12, Jinzaki, in view of Stojancic, teaches performing a new route insertion into a hash table **[Fig. 5, Key Insertion & Database Maintenance 570; key insertion; col. 7, lines 53-67, col. 8, lines 53-58]**, the deletion of a route from a

hash table **[Fig. 5, Key Insertion & Database Maintenance 570; key deletion; col. 7, line 53 - col. 8, line 18]** and the hash table is updated to delete the route **[Fig. 5; Key Insertion & Database Maintenance 570; aged and invalidated; col. 7, lines 53-67]**.

Regarding claim 16, Jinzaki, in view of Dharmapurikar, teaches an ideal offset filter is used **[Figs. 2-3; par. 0055]**.

Regarding claim 18, Jinzaki, in view of Dharmapurikar and Stojancic is silent whether the filter fields are bit interleaved filters.

However, it would have been obvious to a person of ordinary skill in the art at the time of the invention was made to recognize that whether or not the filter fields are interleaved is simply a design choice. Other filters with different filter field structures can also used to perform the longest prefix match speedy and efficiently so long as the selection of number of bits preserving the original order of the prefix in the address is passed down to the filter fields.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,839,703 to Jinzaki, in view of US Patent Application Pub. No. 2005/0086520 A1 by Dharmapurikar et al. (hereinafter "Dharmapurikar"), further in view of US Patent No. 7,219,184 to Stojancic and further in view of US Patent No. 6,947,931 to Bass et al. (hereinafter "Bass").

Regarding claim 9, Jinaki, in view of Dharmapurikar and Stojancic, teaches each limitation set forth in its parent claim.

Jinaki, in view of Dharmapurikar and Stojancic, is silent whether a tree lookup is used to perform the LPM operation.

Bass teaches a LPM algorithm implementation for a network processor using a tree lookup is used to perform the LPM operation **[Abstract, Background & Summary of the Invention, Figs. 5-8, 14-15, etc.]**.

It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to recognize that a tree lookup can be used in either Jinaki's, or Dharmapurikar's, or Stojancic's invention to perform the LPM operation.

The motivation for combining the reference teachings would be to use a Patricia-tree lookup and/or its enhancement, such as the one disclosed by Bass, to quickly and efficiently implement the LPM operation with great time- and cost-savings, since these techniques are well-known in the art.

Response to Remarks

7. The objection to the Specification concerning to "*co-pending U.S. application filed November 24, 2003. The contents of the co-pending application*" is withdrawn. However, a new objection to the Specification is recited in the Section 1 of this office action.

Conclusion

8. Applicant's arguments with respect to claims 1-22 have been considered but are moot in view of the new ground(s) of rejection.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Albert T. Chou whose telephone number is 571-272-6045. The examiner can normally be reached on 8:30 - 17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi H. Pham, can be reached on 571-272-3179. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Albert T. Chou

1/7/2008 AC

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1/9/08